Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)
	)
Revision of Part 15 of the Commission's	)
Rules Regarding Ultra-Wideband	) ET Docket No. 98-153
Transmission Systems	)

JOINT REPLY TO OPPOSITIONS TO PETITION FOR PARTIAL RECONSIDERATION

Sirius Satellite Radio Inc. ("Sirius") and XM Radio Inc. ("XM") jointly reply to oppositions filed by Time Domain Corporation ("Time Domain")[1] and XtremeSpectrum, Inc. ("XtremeSpectrum")[2] to Sirius and XM's joint petition for partial reconsideration (the "Sirius/XM Petition" or "Joint Petition")[3] of the Commission's First Report and Order ("R&O") in this proceeding.[4]

As noted in detail in the Joint Petition, the Commission's adopted UWB rules are both procedurally and substantively flawed and will not protect the millions of future satellite radio listeners nationwide from harmful interference from these unlicensed devices. The UWB proponents offer nothing to alter this conclusion or to undermine the analysis in the Joint Petition. Nevertheless, Sirius and XM shall respond to several of the UWB proponents' arguments that attempt to minimize or deny the harmful impact of the Commission's rules. First, the UWB proponents (mainly Time Domain) proffer a list of scenarios in which UWB devices will cause less interference in practice than the rules permit them to. Most of these scenarios

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[1] *See* Opposition of Time Domain Corporation, ET Docket No. 98-153 (filed July 31, 2002) ("*Time Domain Opposition*").

[2] *See XtremeSpectrum, Inc, Opposition to Petitions for Reconsideration*, ET Docket No. 98-153 (filed July 31, 2002) ("*XtremeSpectrum Opposition*").

[3] *See Sirius Satellite Radio Inc. and XM Radio Inc., Joint Petition for Partial Reconsideration*, ET Docket No. 98-153 (filed July 17, 2002).

[4] *See Revision Of Part 15 Of The Commission's Rules Regarding Ultra-Wideband Transmission Systems*, First Report and Order, FCC 02-48 (rel. Apr. 22, 2002) (the "*R&O*").

would in fact reduce interference—provided the Commission modified the rules to adopt the UWB proponent's suggestions as requirements. Additionally, based on a reference to the Commission's Part 27 proceeding, Time Domain mistakenly claims that the unlicensed, Part 15 UWB device proponents have the status of operators of licensed services, and then simply assert that the Commission's inadequate analysis of UWB-SDARS interference was conducted in a manner similar to the Part 27 proceeding. Finally, both UWB proponents engage in a number of irrelevant, misleading, and flatly incorrect technical arguments, none of which affect the conclusion of the Joint Petition.

I. The UWB proponents' claims for lessened interference to SDARS

A. "Terrestrial repeaters will prevent UWB interference." Both UWB proponents claim that Sirius and XM have understated the extent to which terrestrial repeaters will protect satellite radio from UWB interference, since supposedly either a "majority of [SDARS] users"[5] or a "large fraction of the population"[6] will be "served by terrestrial augmentation of the satellite signal."[7] Apparently, the UWB proponents finally accept the fact that UWB signals *will* interfere with satellite radio, but argue that this is not a problem since the SDARS licensees can protect *some* satellite radio listeners with repeaters.

Time Domain claims that since repeaters will be located "around cities" and "*[t]his is also the environment wehre [sic] UWB devices will be found*,"[8] there is no UWB problem for satellite radio listeners who are located near repeaters. Time Domain seems to propose that UWB devices be limited to deployment "around cities" (or around repeaters).

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[5] Time Domain Opposition at 12.

[6] XtremeSpectrum Opposition at 23.

[7] Time Domain Opposition at 12.

[8] *See* Time Domain Opposition at 12. XtremeSpectrum makes no similar implied proposal. Apparently for XtremeSpectrum any satellite radio listener not in the undefined "large fraction" of users near a repeater just has to accept UWB interference.

While a good idea, this restriction would not solve the UWB interference problem. As Time Domain correctly notes, repeaters are employed in "locations…where the satellite signal would be subject to 'blockage fading, and foliage attenuation.'"[9] Repeaters provide a modest boost and some help with these attenuation problems. Repeaters can not fully protect against the *additional* problem of UWB interference.[10] Nevertheless, restricting UWB devices to areas where terrestrial repeaters will be located would help reduce UWB interference to satellite radio. Sirius and XM support a modification to the UWB rules adopting this restriction. If the Commission determines that this restriction could not be effectively enforced,[11] then the 8.6 µV/m limit proposed in the Joint Petition should be adopted universally.[12]

B. Certain surveillance devices will be used only far from SDARS. Time Domain downplays the potential for interference from UWB surveillance devices by focusing on one particular type of surveillance application—so-called "field disturbance sensors" which only have utility in a "protected area" away from objects or people.[13] However, nothing in the rules indicates that this is the only type of surveillance device possible, and naturally nothing in the rules indicates that this or any other type of surveillance device would have to be, or would actually be used in this manner, *i.e.*, far from roadways and passing objects.

Time Domain specifically indicates that the interference from field disturbance sensors will be reduced since these devices "would be well behind a chain link fence or other

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[9] *See* Time Domain Opposition at 12.

[10] *See* Sirius/XM Petition at 20 (explaining that because of the only modest signal boost added by repeaters and because of signal fading, repeaters will not solve the interference problem for many of the SDARS receivers at issue).

[11] For example, it would be extremely difficult to keep hand-held UWB devices from being used away from cities and/or terrestrial repeaters, even if they were initially sold, marketed and used in those areas.

[12] Sirius and XM maintain their position that to protect satellite radio reception, aggregate emissions from unlicensed devices should be no higher than 8.6 µV/m at 3 meters. *See* Sirius/XM Petition at 2.

[13] *See* Time Domain Opposition at 13-14.

obstacle much farther from a roadway than 8.8 meters."[14] As Sirius and XM have explained, the Commission's 8.8 meter separation distance is vastly understated: in fact, a UWB surveillance device would have to be at least 55 meters from a satellite radio receiver to prevent harmful interference.[15] Perhaps this is what Time Domain means by "much farther than 8.8 meters." If so, Sirius and XM support a modification to the UWB rules that would require UWB surveillance devices to be installed at least 55 meters from areas where a satellite radio receiver would pass that device, for example, at least 55 meters from a roadway. Alternatively, the Commission should adopt the 8.6 μV/m limit proposed in the Joint Petition.

C. Roll-off characteristics of UWB signals. Finally, Time Domain describes roll-off characteristics for communications and surveillance devices, and claims that satellite radios will benefit from a 10 dB reduction below the R&O emission limits for surveillance devices, and a "30 dB or more" reduction below the R&O limits for hand-held devices.[16]

Unfortunately, both the maximum level permitted under the rules *and* the levels Time Domain claims will result from the roll-off are higher than the 8.6 μV/m at 3 meter limit required to protect satellite radio operations. Time Domain's ability to reduce emissions in the SDARS band is a step in the right direction, but not far enough. Sirius and XM would support a modification to the rules requiring UWB devices to roll off their emissions at the edges of the bands in which they are allowed to operate to the extent indicated in Time Domain's opposition, plus an additional 5 dB reduction in the SDARS band for hand held-devices and an additional 25 dB reduction in the SDARS band for surveillance devices.

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[14] Time Domain Opposition at 13-14.

[15] *See* Sirius/XM Petition at 10-11.

[16] *See* Time Domain Opposition at 15. Time Domain claims to show that the Commission was right and that UWB emissions would likely be "somewhat below the maximum level permitted under the rules." Time Domain Opposition at 15, quoting R&O at ¶169.

II. Time Domain's policy and procedural arguments based on the Part 27 Order.

A. SDARS supposedly has no grounds to complain about UWB interference.

Time Domain's first misguided argument based on the Part 27 Order[17] ignores the fact that UWB devices are in the process of being authorized as *Part 15 unlicensed devices*, and attempts to show that SDARS licensees are making unsupportable claims for protection from interference.

The Commission's statement in the Part 27 Order that coordination between SDARS and WCS involved "limit[ing] the potential for interference to a reasonable level" and that "a desire for an interference free radio service must be balanced with the need to provide reasonable operating parameters for adjacent services"[18] makes sense only in the context of coordination between licensed services. For licensed services, the Commission must often strike a balance between protecting each service and enabling multiple services. In the case of *unlicensed* devices, however, this "balance" has already been determined by the Commission's rules. Unlicensed Part 15 devices must accept interference from licensed services, and can not cause interference to licensed services. Transient interference—"brief, randomly occurring, and transitory," as Time Domain defines it—is interference, and of a type specifically damaging to satellite radio. At any rate, Time Domain's focus on transient interference (which the Commission identifies only in the context of surveillance devices) is misleading, since UWB devices (especially hand-held devices) will also cause continuous interference to satellite radio. Part 15 UWB devices simply may not cause harmful interference to satellite radio, period.

B. Assertion that the Commission adequately analyzed UWB interference into SDARS. Time Domain inexplicably claims that, like in the Part 27 proceeding, the Commission

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[17] *See* Sirius/XM Petition at 6, citing 47 C.F.R. §27.53(a)(2); *see also Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service ("WCS")*, Memorandum Report and Order, 12 FCC Rcd 3977 (1997) ("*Part 27 Order*"). Time Domain also makes one incorrect *technical* argument based on the Part 27 Order, discussed below in Section III.

[18] Time Domain opposition at 16, quoting Part 27 Order at ¶ 25.

"used, for each system [SDARS and UWB], specific technical information as to the potentially interfering device and the victim receiver to analyze the risk of interference."[19] Sirius and XM are at a loss as to where this careful and device-specific analysis is found in the R&O. The R&O's cursory discussion of UWB interference to satellite radio bases the erroneous separation distance not on a specific UWB device, but on some undefined "UWB signal."[20] This discussion did not even use the appropriate technical data for satellite radio receivers.[21] The balance of the R&O's one-paragraph "analysis" does in fact refer to *only one* specific type of UWB device—vehicular radars, which are highly unlikely to cause interference to satellite radio.[22] The Commission's discussion lacks *any* meaningful analysis of UWB interference to satellite radio. None of this bears any resemblance to the approach taken in the Part 27 proceeding—and none of it meets the requirements of the Administrative Procedure Act.

III. UWB industry's technical arguments are incorrect, unsupported, or irrelevant.

A. Assertion that Part 27 levels are equivalent to adopted UWB emissions levels.

Time Domain takes issue with Sirius and XM's reference to the adoption in the Part 27 Order of a far more appropriate protection for SDARS receivers, namely an EIRP of –80 dBm. Time Domain claims that "the DARS band was *not necessarily* afforded that level of protection," since "the previously adopted emissions mask of –80 dBm EIRP *could* be significantly relaxed to permit an out-of band emission level of 93 + 10log(p) dB equivalent to a level of –63 dBm for portable devices."[23] This is highly disingenuous. The baseline –80 dBm EIRP (equivalent to 5.8 μV/m) adopted for WCS can be relaxed to –63 dBm only under very limited conditions

[19] Time Domain Opposition at 17.

[20] R&O at ¶169.

[21] *See* Sirius/XM Petition at 10-11.

[22] *See* Sirius/XM Petition at 10-22.

[23] Time Domain Opposition at 16-17 (emphasis added).

specifically adopted to provide protection to SDARS receivers (including an antenna polarization requirement, power limitations, separation distances, and a ban on vehicle-mounted units), and only for one type of WCS device.[24] No comparable operating limitations were adopted or even adequately considered for UWB devices. In the Part 27 proceeding the Commission carefully considered SDARS requirements and derived a baseline emission limit much closer to that actually needed to protect SDARS reception, with a very carefully tailored exception. Time Domain's fixation with the limited Part 27 exception does not alter the fundamental fact that the emission limits adopted for UWB are inadequate and were based on completely inadequate consideration of SDARS system characteristics.

B. The SDARS link margin is supposedly "excessive."[25] Time Domain's bald, unquantified assertion regarding the SDARS link margin is simply wrong. In fact, the SDARS link budget is reasonable, and has been designed in keeping with standard satellite system design. SDARS link budgets have been carefully designed to accommodate propagation effects such as blockage, fading, and foliage attenuation (including the interaction of these factors) and terrestrial interference sources including Part 15 and Part 18 devices. Nevertheless, despite a reasonable link budget, UWB devices will cause harmful interference to satellite radio.

C. Indoor SDARS. In the Joint Petition, Sirius and XM refuted the Commission's statement that a satellite radio receiver, if not operating in a vehicle, will be "mounted . . . on the roof or side of a building."[26] Sirius and XM noted that many satellite radio receivers can operate

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[24] "These less stringent out-of-band limits may be used only if the average portable transmit power is limited to 25 mW, the peak portable transmit power is limited to 200 mW, the portable devices employ means to limit the power to the minimum necessary for successful communications, the portable devices have a duty cycle of 12.5% or less, and the portable devices use time division multiple access ("TDMA") technology." Part 27 Order at ¶ 33.

[25] *See* Time Domain Opposition at 12.

[26] R&O at ¶ 169.

indoors without an outdoor antenna.[27] In their Oppositions, both Time Domain and XtremeSpectrum contend that, given that satellite radio signals are weak by the time they reach the ground, it is impossible to receive these signals indoors due to building loss without either an outdoor antenna or a nearby terrestrial repeater.[28] This not the case. In many instances, it is possible to receive satellite radio with an indoor antenna in an area unserved by a terrestrial repeater. Admittedly, the satellite signal is severely attenuated in this type of reception environment, which makes interference from indoor UWB devices of greater concern.

In addition, as Time Domain and XtremeSpectrum suspect, many listeners also use indoor antennas to receive satellite radio signals in areas covered by a terrestrial repeater. Due to building loss, however, the repeater signal is attenuated in an indoor environment, again making interference from indoor UWB devices problematic. Thus, even if indoor reception of satellite radio is possible in certain environments only with a nearby terrestrial repeater, interference from unlicensed devices is still a concern.

D. Antenna Polarization. The Commission stated that "we do not believe that a factor for polarization mismatch loss should be included in the analysis," because UWB "polarizations are unknown at this time."[29] However, by assuming that UWB antennas are only linearly polarized, the Commission's assumption regarding polarization mismatches is unreasonable, resulting in shorter separation distances than may actually be required. Further, the rules do not require UWB systems to use linear polarization, so there is no basis for assuming future UWB devices will be designed with such antennas. The rules should specify the UWB antenna polarization. In addition, XtremeSpectrum's criticism of the Joint Petition on this

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[27] Sirius/XM Petition at 11-12.

[28] Time Domain Opposition at 14; XtremeSpectrum Opposition at 27.

[29] R&O at ¶ 92.

point[30] is irrelevant because it disregards that fact that SDARS antennas use both linear polarization and circular polarization.

E. SDARS receiver noise temperature. XtremeSpectrum disputes Sirius and XM's conclusion that the Commission erred in assuming a 360° K receiver noise temperature.[31] However, as demonstrated in the Joint Petition, the temperature could vary from 158° to 290° K. By assuming 360° K, the Commission understated the sensitivity of the receiving systems and reduced the separation distance to unacceptable values. The Technical Appendix to the Joint Petition shows that by using more reasonable receiver noise temperature, distances are increased by about 50% to 60%, *e.g.*, 3 m for handheld devices is increased to 4.5 m, and 8.8 m for indoor devices is increased to 14 m.

F. 2400 MHz emissions. XtremeSpectrum claims that Sirius and XM overlook permitted emissions from ISM devices operating in the 2400 MHz band, which are higher than UWB emissions (but provides no information about the characteristics of these emissions).[32] In any case, we assume that XtremeSpectrum's implication is that UWB emissions will not interfere with satellite radio since there are other emissions that could potentially interfere with satellite radio as well. In fact, SDARS systems have been designed with the expectation that some interference will be inevitable from all sources, but not at the level now being proposed for just one of these systems, *i.e.*, UWB. Furthermore, both Sirius and XM continue to address the problem of interference from a variety of sources other than UWB—in other proceedings.[33]

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[30] XtremeSpectrum Opposition at 22.

[31] XtremeSpectrum Opposition at 22.

[32] *See* XtremeSpectrum Opposition at 23.

[33] In addition to the UWB proceeding, either Sirius or XM or both have urged the Commission to ensure that out-of-band emissions from adjacent band services do not interfere with satellite radio in the following proceedings: RF Lighting Proceeding, ET Docket 98-42; Garmin International, Inc. NPRM, WT Docket No. 01-339; Part 15 Biennial Review NPRM, ET Docket No. 01-278; Licensing Rules for

G. *Separation distance.* XtremeSpectrum argues that a 3 meter "or less" separation distance between an indoor UWB device or a hand-held UWB device and an SDARS antenna is sufficient to protect against harmful interference.[34] Sirius and XM have already demonstrated that the Commission relied on incorrect assumptions to derive its separation distance of 8.8 meters,[35] and XtremeSpectrum accentuates this error.

IV. Conclusion

For the reasons described above, Sirius and XM respectfully request that the Commission reconsider its rules in the First Report and Order with respect to the emission limits on UWB communications and surveillance devices. This Joint Reply to Oppositions to Petition for Partial Reconsideration provides further support for an emission limit of 8.6 μV/m at 3 meters for out of band energy into the DARS band from 2320-2345 MHz, to adequately protect against interference into satellite radio receivers.

Respectfully submitted,

Sirius Satellite Radio Inc.

/s/ David M. Leive
Nicholas Allard
David M. Leive
Elizabeth R. Park
Latham & Watkins
555 11th Street NW
Washington, DC 20004

Counsel for Sirius Satellite Radio Inc.

XM Radio Inc.

/s/ Bruce D. Jacobs
Bruce D. Jacobs
David S. Konczal
Shaw Pittman LLP
2300 N Street NW
Washington, DC 20037

Counsel for XM Radio Inc.

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the 2385-2390 MHz Band, WT Docket No. 02-08; NTIA Report on Accommodating 3G Wireless Systems in the 1710-1770 MHz and 2110-2170 MHz Band, ET Docket 00-258.

[34] *See* XtremeSpectrum Opposition at 23.

[35] *See* Sirius/XM Petition, Technical Appendix.

CERTIFICATE OF SERVICE

I hereby certify that I have this fourteenth day of August, 2002, caused a true copy of the foregoing "Joint Reply to Oppositions to Petition for Partial Reconsideration" to be served by U.S. mail, on the following:

Mitchell Lazarus
Fletcher, Heald & Hildreth, P.L.C.
1300 North 17th Street, 11th Floor
Arlington, VA 22209
Counsel for XtremeSpectrum, Inc.

Paul Withington
Vice President
Time Domain Corporation
Cummings Research Park
7057 Old Madison Pike
Huntsville, AL 35806

/s/ Elizabeth R. Park
Elizabeth R. Park